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EXAMINER	
ZHENG, LOIS L	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/776,472	BRANAGAN, DANIEL JAMES	
	Examiner	Art Unit	
	LOIS ZHENG	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 February 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 12-14* is/are pending in the application.

4a) Of the above claim(s) *1-5* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6,7 and 12-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8 February 2010 has been entered.

Status of Claims

2. Claim 6 is amended in view of applicant's response filed 8 February 2010. Claims 8-11 and 15-16 are canceled. Claims 1-5 remain withdrawn from consideration. Therefore, claims 6-7 and 13-14 are currently under examination.

Claim Objections

3. Claims 12-14 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 12 recites "said oxygen seeking nonmetal/metalloid is selected from the group consisting of silicon, carbon, phosphorus, sulfur and combination thereof". Claim 12 depends on independent claim 6 which recites "an oxygen seeking nonmetal/metalloid including boron". The scope of the oxygen seeking nonmetal/metalloid as recited in claim 12 is entirely different from the scope of the

oxygen seeking nonmetal/metalloid as recited in claim 6. Therefore, dependent claim 12 does not further limit the subject matter of independent claim 6.

Claim 13 recites "said manganese is present at about 2.3%". Claim 13 depends on independent claim 6 which recites "said alloy includes deoxidizing elements including manganese" and "deoxidizing element is present between 5%-70% in said iron based metallic coating alloy". The scope of the amount of manganese as recited in claim 13 falls outside of the scope of the amount of manganese as recited in claim 6. Therefore, dependent claim 13 does not further limit the subject matter of independent claim 6.

Claim 14 recites "said manganese is present at about 0.8%". Claim 14 depends on independent claim 6 which recites "said alloy includes deoxidizing elements including manganese" and "deoxidizing element is present between 5%-70% in said iron based metallic coating alloy". The scope of the amount of manganese as recited in claim 14 falls outside of the scope of the amount of manganese as recited in claim 6. Therefore, dependent claim 14 does not further limit the subject matter of independent claim 6.

Appropriate correction is required.

Claim Interpretation

4. Regarding claim 6, since no specific order is required for executing processing steps, the examiner is interpreting that the sequence of the claimed processing steps can take place in any order. In addition, since processing steps recite the same iron based metallic coating alloy and the metal surface is relatively clean(i.e. the cleaned surface may still contain oxides) with the application of the iron based metallic coating alloy, the examiner is interpreting that the claimed processing step of applying the liquid

metal of the iron based alloy to an oxidized metal surface to provide a clean metal surface and the claimed processing step of applying an iron based metallic coating alloy to the clean metal surface may take place simultaneously(i.e. these two processing steps are the same coating application step) based on the broadest reasonable interpretation.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 6-7 and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dorfman US 4,822,415(Dorfman), and further in view of Kim et al. US 5,643,531 (Kim).

Dorfman teaches thermal spraying processing using an iron based alloy powder to produce a protective coating(abstract, col. 1 lines 6-9). Dorfman's iron based alloy composition comprises Cr, B and C(abstract, col. 2 line 66 – col. 3 line 65). Dorfman further teaches that preferably less than 15% manganese can be included in the iron based alloy to improve corrosion resistance and ductility, preferably Zr, Nb, Ti, Va, Hf in a total amount of less than 10% can be added to further improve wear and corrosion resistance, and preferably phosphorous in an amount of less than 1% can be added to reducing melting point(col. 4 lines 6-18). The iron based alloy powder as taught by

Dorfman can be produced by standard method such as atomization and the thermal spray process using the iron based alloy powder produces a coating that is entirely amorphous(col. 4 lines 53-63). Dorfman further teaches that the thermal spraying process is a plasma spraying process(col. 1 lines 24-39).

Regarding claim 6, the thermal spraying process as taught by Dorfman includes the claimed step of providing an atomized iron based metallic coating alloy comprising the claimed deoxidizing elements including manganese, a metal selected from Cr, Va, Ti, Zr, Hf, Nb and combination thereof and an oxygen seeking nonmetal/metalloid including boron. The thermal spraying process as taught by Dorfman also melts the iron based coating alloy as claimed and applies the iron based coating alloy to a metal surface to provide a coating layer(col. 4 lines 56-59). The claimed removing of oxidized metal surface layer, which reads on a metal surface with a native oxide layer, to provide a relatively clean metal surface is inherently taking place in the coating application process of Dorfman.

However, Dorfman does not teach that the thermal spraying process is a process of metallic coating by claimed high velocity oxy-fuel spraying technique.

Kim teaches applying a ferrous alloy coating to a metal substrate of similar composition, wherein the ferrous coating alloy comprises 18-42wt% Cr, 1.0-3.2 wt% Mn, 3.0-4.5wt% B, 1.0-3.0 wt% Si, less than 0.3wt% C and less than 0.5wt% of P (abstract, col. 2 lines 53-63). Kim further teaches that the ferrous coating alloy is made into powder and can be applied by various thermal spraying techniques such as HVOF(i.e.

high velocity oxyfuel), plasma, etc. depending on the shape to be sprayed.(col. 3 lines 31-40).

Therefore, it would have been within the skill of one of ordinary skill in the art to have picked and chosen various thermal spraying techniques in the thermal spraying process of Dorfman, including HVOF, depending upon the shape to be sprayed in order to achieve expected success of producing an amorphous metallic coating as taught by Kim.

In addition, since the iron based metal alloy as taught by Dorfman in view of Kim comprises manganese, it would have inherently had the function of a deoxidizing element as claimed and would have been capable of removing oxygen from the metal surface layer as claimed. Furthermore, Dorfman does not The total amount of manganese in the iron based metal alloy as taught by Dorfman in view of Kim overlaps the claimed deoxidizing element amount of 5-70%. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05.

Furthermore, since Dorfman in view of Kim is silent with respect to precipitation of manganese from the alloy and Dorfman in view of Kim teach a coating process that is substantially the same as claimed coating process, one of ordinary skill in the art would have expected that the manganese in the iron based coating alloy of Dorfman in view of Kim would have remained dissolved in the alloy melt as claimed, which would have retained an affinity for oxygen as claimed.

Furthermore, regarding the claimed coating thickness of 40-110mil, Example 1 of Dorfman produces a coating thickness of up to 1.3 mm(i.e. up to 51.181 mil)(col. 5 lines

59-61), which overlap the claimed coating thickness. In addition, it is well known in the coating art that the coating thickness depends on the desired level of protection which varies for different applications. It is also well known in the coating art that the coating thickness is determined by the length of coating time. In other words, the longer the metal surface is sprayed with the coating composition, the thicker the coating becomes. Therefore, it would have been obvious to one of ordinary skill in the art to have varied the coating time via routine optimization in order to achieve desired coating thickness for desired level of protection for the metal substrate.

Furthermore, the examiner takes a position that the claimed ASTM C633 bond strength is an inherent property of the metallic coating layer. Since Dorfman in view of Kim teach a coating process that is substantially the same as the claimed coating process using an iron based alloy that is substantially the same as the claimed iron based coating alloy, the coating layer formed by the process of Dorfman in view of Kim would also have an ASTM C633 bond strength that is substantially the same as the claimed and is also present in the claimed coating thickness. In other words, one of ordinary skill in the art would have found the claimed ASTM C633 bond strength of at least 12,000psi obvious in a coating thickness from 40-110mil formed by the coating process of Dorfman in view of Kim because Dofman in view of Kim use the substantially the same metallic coating as claimed in a substantially the same coating process as claimed.

Lastly, Dorfman further teaches that its iron based coating alloy is characterized by a combination of improved properties such as corrosion resistance, frictional wear

resistance and abrasive wear resistance(col. 2 lines 53-57). Dorfman in view of Kim is also silent with respect to the claimed coating failure at a coating/metal surface interface. Therefore, one of ordinary skill in the art would not have expected the claimed coating failure to occur in the coating produced by the process of Dorfmann in view of Kim absent persuasive evidence that the coating produced by the process of Dorfmann in view of Kim would fail at the coating/metal surface interface.

Regarding claim 7, Dorfman further teaches that iron based alloys with lower boron content exists in amorphous form if produced by quenching(col. 4 lines 26-30). Therefore, the examiner concludes that the process of Dorfman in view of Kim does not produce precipitate when the iron based alloy is melted.

Regarding claim 12, Dorfman further teaches the claimed oxygen seeking non-metal/metalloid such as carbon and phosphorous.

Regarding claims 13-14, the less than 15% of Mn as taught by Dorfman in view of Kim encompasses the claimed about 2.3% and the claimed about 0.8% Mn. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05.

Response to Arguments

7. Applicant's arguments filed 8 February 2010 have been fully considered but they are not persuasive.

In the remarks, applicant argues that Dorfman does not teach that the deoxidizing element remain dissolved in the ferrous alloy melt to retain an affinity for oxygen because manganese is an optional element in Dorfmann and is added to improve corrosion resistance and ductility.

The examiner does not find applicant's argument persuasive because the reason for Dorfmann's use of manganese does not have to be the same as claimed. As long as manganese is present in the iron based coating alloy of Dorfmann, it would have also been capable of deoxidizing any oxide on the surface of the metal substrate as claimed. In addition, as discussed in paragraph 6 above, Dorfman is silent with respect to precipitation of manganese from the iron based coating alloy melt and Dorfman in view of Kim teach a coating process that is substantially the same as claimed coating process, one of ordinary skill in the art would have expected that the manganese in the iron based coating alloy of Dorfman in view of Kim would have remained dissolved in the alloy melt as claimed, which would have retained an affinity for oxygen as claimed.

Applicant further argues that Dorfman does not teach failure of coating does not occur at a coating/metal surface interface as claimed.

As set forth in paragraph 6 above, Dorfman teaches that its iron based coating alloy is characterized by a combination of improved properties such as corrosion resistance, frictional wear resistance and abrasive wear resistance(col. 2 lines 53-57). Dorfman is also silent with respect to the claimed coating failure at a coating/metal surface interface. Therefore, one of ordinary skill in the art would not have expected the claimed coating failure to occur in the coating produced by the process of Dorfmann in view of Kim absent persuasive evidence that the coating produced by the process of Dorfmann in view of Kim would fail at the coating/metal surface interface.

Applicant further argues that paragraph [0021] of the published application shows remarkable results and extremely effective metallurgical bond are obtained with claimed process.

Applicant's argument appears to be directed to superior or unexpected results, which must be factually supported by an appropriate affidavit or declaration to be of probative value. See In re De Blauwe, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984) and MPEP 716.01(c). Evidence of unexpected properties may be in the form of a direct or indirect comparison of the claimed invention with the closest prior art which is commensurate in scope with the claims. See In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and MPEP § 716.02(d) - § 716.02(e). However, paragraph [0021] of the published application does not provide such comparison. Since the proof of factual evidence is lacking, the examiner does not find applicant's argument persuasive.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Surface Hardening of Steels, page 8, Table 4, shows that HVOF coating process produces a ferrous coating with higher bond strength than plasma spraying process.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LOIS ZHENG whose telephone number is (571)272-1248. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ Roy King/
Supervisory Patent Examiner, Art Unit 1793

LLZ